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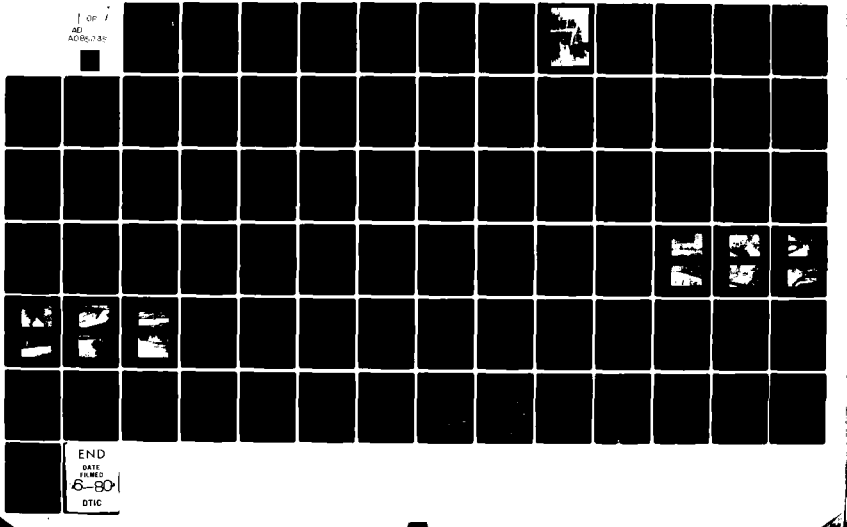

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OHIO RIVER BASIN

PIFFER RUN OF LITTLE SANDY CREEK, VENANGO COUNTY

PENNSYLVANIA

POLK DAM

NDI No. PA 00253
PennDER No. 61-7

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

MICHAEL BAKER, JR., INC.

DACW31-80-C-~~0020~~ 0025

prepared for

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

prepared by

MICHAEL BAKER, JR., INC.
Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

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March 1980

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OHIO RIVER BASIN

(1)

POLK DAM
VENANGO COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00253
PennDER No. 61-7

(6) PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.

Polk Dam (NDI Number PA-00253, PennDER Number 61-7), Ohio River Basin, Pitten Run of Little Sandy Creek, Venango County, Pennsylvania, Phase I Inspection Report.

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(15) DACW31-80-C-0035 (11) May 80

Prepared by: MICHAEL BAKER, JR., INC.
Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

(12) 22 (10) John A. Dziubek

410795

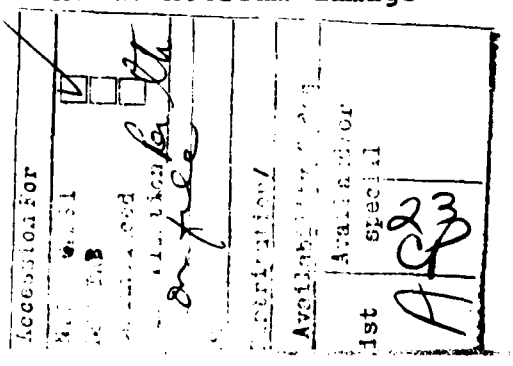
PREFACE

This report is prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Polk Dam, Venango County, Pennsylvania
NDI No. PA 00253, PennDER No. 61-7
Piffer Run of Little Sandy Creek
Inspected 10 December 1979

ASSESSMENT OF GENERAL CONDITIONS

Polk Dam is owned by the Polk State School and Hospital and is classified as a "Significant" hazard - "Small" size dam. The dam was found to be in fair overall condition at the time of inspection.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will not pass the 100-year flood without overtopping the dam. A spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF) is required for Polk Dam. The 100-year flood was chosen as the SDF. During the 100-year flood, the dam is overtopped by a maximum of 0.61 foot for a duration of 1.50 hours. The spillway is therefore considered "inadequate." It is recommended that the owner immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

Several items of remedial work should be performed by the owner without delay. Item 1 below should be completed by a qualified professional engineer experienced in the design of hydraulic and appurtenant structures for earth dams. These include:

1) The owner should immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

2) Fill the two depressions on the downstream slope of the dam and monitor these areas in future inspections to determine if additional remedial work is necessary.

3) The sloughing and erosion of the downstream slope adjacent to the spillway structure should be repaired. It is recommended that the slope be partially cut back in this area so as to decrease or stop the sloughing and erosion.

4) After the sloughing and erosion noted in item 2 is repaired, the slightly tilted spillway wall should be repaired.

5) The masonry in the spillway structure should be repointed to prevent the migration of embankment material into the spillway and the infiltration of water from the spillway into the embankment.

6) Remove the silt and trash at the entrance to the spillway.

7) Fill the rodent/animal burrow in the embankment.

8) The condition and operability of the outlet works should be examined and any necessary repairs performed.

9) The tree to the right of the spillway on the upstream slope should be removed and the excavated area regraded and compacted.

In addition, the following operational measures are recommended to be undertaken by the owner:

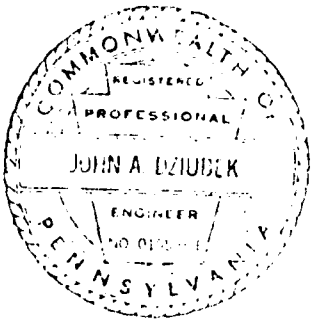
1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented.

POLK DAM



Submitted by:

MICHAEL BAKER, JR., INC.

John A. Dziubek, P.E.
Engineering Manager-Geotechnical

Date: 28 March 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 29 April 1980

POLK DAM

OVERALL VIEW OF DAM

TABLE OF CONTENTS

APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
POLK DAM
NDI No. PA 00253, PennDER No. 61-7

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances - Polk Dam is located on the grounds of the Polk State School and Hospital at Polk, Pennsylvania. It was constructed (estimated between 1895 and 1909) to supply water and ice for the facility but is no longer used in this capacity. Its present function is for ice skating in the winter and for aethestics of the facility grounds.

Very little information exists concerning the original construction of this dam because records for Pennsylvanian dams were not kept prior to 1913.

The dam is approximately 25.7 feet high (maximum height) and 377 feet long. The upstream slope above the pool level is 1.67H:1V (Horizontal to Vertical) and the downstream slope is 4H:1V.

The spillway is a masonry stone structure located at the left abutment of the dam. The crest of the spillway is an open channel 10.5 feet long (perpendicular to flow) and 25 feet wide (parallel to flow). An 8.5 foot drop is located at the end of the 25 foot crest length. The downstream channel, consisting of masonry stone, continues for an additional 300 feet downstream.

The outlet works for the dam consist of an 8 inch or 10 inch cast-iron pipe through the embankment.

The owner is unsure of the correct size of the pipe, but the 8 inch size was more commonly used at the time of construction. A valve for the pipe is located just upstream of the crest of the embankment and a concrete riser and stem can be observed on the upstream slope. Details concerning the intake are unavailable. The discharge end of the pipe extends through the wall of the downstream channel. The pipe at this location is a 16 inch corrugated metal pipe.

b. Location - Polk Dam is located on a tributary of Little Sandy Creek in the Borough of Polk, Venango County, Pennsylvania. This tributary is known locally as Piffer Run. The coordinates of the dam are N 41° 22.5' and W 79° 55.8'. The dam and reservoir can be located on USGS 7.5 minute topographic quadrangles, Polk and Utica, Pennsylvania.

c. Size Classification - The maximum height of the dam from the minimum top of dam to the toe of the downstream slope (best information available) is 25.7 feet. The reservoir volume to the top of dam, Elevation 1099.7 feet Mean Sea Level (M.S.L.), is 115.0 acre-feet. The dam is therefore in the "Small" size category.

d. Hazard Classification - Because property damage is likely 2300 feet downstream from the dam but loss of life due to failure of the dam is unlikely, the dam is classified in the "Significant" hazard category.

e. Ownership - The dam and reservoir are owned by the Commonwealth of Pennsylvania, Department of Public Welfare, Polk State School and Hospital, P.O. Box 94, Polk, Pennsylvania 16342. Mr. Adam Gazek is the current Institutional Maintenance Superintendent.

f. Purpose of Dam - The reservoir is used for recreation and aesthetic appearances of the center grounds. At one time the reservoir was used for water and ice supply.

g. Design and Construction History - No specific design and construction history is available. The dam was constructed subsequent to the facilities (circa 1895) and prior to 1909.

h. Normal Operational Procedures - The spillway is uncontrolled and the reservoir is typically at the spillway crest elevation (Elevation 1093.0 feet

M.S.L.). Since the dam and reservoir are on the grounds and a roadway is located on the crest, the maintenance personnel typically drive over the dam at least once a day.

1.3 PERTINENT DATA

a. Drainage Area (square miles) -	1.43
b. Discharge at Dam Site (c.f.s.) -	
Maximum Flood -	Unknown
Spillway Capacity (at pool El. 1098.0 ft.)[1] -	315
c. Elevation[2] (feet above M.S.L.) -	
Average Top of Dam -	1100.0
Minimum Top of Dam -	1099.7
Spillway Crest -	1093.0
Streambed at Toe of Dam[3] -	1074±
Maximum Tailwater of Record -	Unknown
d. Reservoir (feet) -	
Length of Maximum Pool -	1900
Length of Normal Pool -	1200
e. Storage (acre-feet) -	
Top of Dam (El. 1099.7 ft.) -	115.0
Normal Pool (El. 1093.0 ft.) -	51.6
f. Reservoir Surface (acres) -	
Top of Dam (El. 1099.7 ft) -	11.46
Normal Pool (El. 1093.0 ft.) -	7.65
g. Dam -	
Type -	Earthfill
Length (feet) -	377
Height (feet) -	25.7

[1]El. 1098.0 ft. is the elevation of the low chord of the bridge deck over the spillway. The top of the bridge deck is at approximately the same elevations as the minimum top of dam. Sufficient head will not develop behind the bridge deck to increase flow through the spillway above the peak discharge of 315 c.f.s. before the dam is overtopped.
[2]All elevations referenced to assumed elevation of the bridge deck over the spillway, El. 1100.0 ft. M.S.L.
[3]Estimated.

Top Width (feet) -	21
Side Slopes - Upstream -	1.67H:1V
Downstream -	4H:1V
Zoning -	Unknown
Impervious Core -	Unknown
Cut-off -	Unknown
Grout Curtain -	Unknown
Drains -	None

h. Diversion and Regulating Tunnel - None

i. Spillway -

Type -	Masonry stone open channel
Length of Crest Perpendicular to Flow (feet) -	10.5
Width of Crest Parallel to Flow (feet) -	25
Crest Elevation (feet M.S.L.) -	1093.0
Gates -	None
Upstream Channel -	Reservoir
Downstream Channel -	Masonry stone rectangular channel

j. Regulating Outlets - An eight or ten inch cast-iron pipe (Note: The owner is unsure of the size. An eight inch pipe was a more commonly used size about the time the dam was constructed.) is located at Station 3+08 (See field sketch in Appendix A for stationing). A valve box is located on the upstream slope of the dam. The discharge end of the pipe which exits through the masonry stone wall of the downstream channel is a 16 inch corrugated metal pipe. No information is available concerning the intake.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The review of information for this dam included the Pennsylvania Department of Environmental Resources' (PennDER) File No. 61-7. The following information is contained in the correspondence file for this dam:

1) Initial inspection report by an engineer of the Water Supply Commission of Pennsylvania, dated 20 August 1919.

2) "Report on Condition of Dam by Owner" to the Water and Power Resources Board, Department of Forests and Waters, dated 2 May 1924.

3) Inspection Report by an engineer of the Water and Power Resources Board, date of inspection 4 August 1925.

4) Inspection Report by an engineer of PennDER, date of inspection 6 October 1965. This inspection noted that the owner was in the process of flattening the downstream slope. This report also noted trees and brush on the upstream face.

5) Miscellanceous correspondence in November and December, 1965 between PennDER and the Superintendent of Polk State School and Hospital concerning the brush on the upstream face.

6) Memorandum to file noting an inspection on 19 January 1966 by another engineer from PennDER noting that shrubs on the upstream face are not detrimental to the safety of the dam.

7) Four photos from the 1919 inspection and three photos from the 1965 inspection.

Information presenting the design or plans of the dam was not available.

2.2 CONSTRUCTION

The Polk State School and Hospital facilities were constructed circa 1895 and it is estimated the dam was constructed at the same time for water (and ice) supply. Modifications performed to the dam which are known to

the personnel currently responsible for the maintenance and can be determined from information available in the PennDER include:

1) The road on the crest of the dam was revised from brick or block lined (1919) to the current oil and chipped rock surface.

2) The downstream slope was flattened in October 1965. The photographs indicate the downstream face was very irregular prior to flattening. The method of filling was (according to the photograph) end dumping from the top of dam and hand spreading over the slope.

3) The pool was partially drawn down in 1946 or 1947 for dredging the upper end of the reservoir.

4) The pool was totally drained in the summer of 1963 and the reservoir dredged by Hasbrook Construction Company.

5) In 1970 a waterline, which passes through the downstream embankment parallel to the crest, was replaced by a waterline located downstream from the dam (see Plate 3 for details).

6) Repairs were made to the spillway training walls at the entrance to the spillway channel between Elevations 1097.0 and 1098.0 feet M.S.L. because of seepage along the right training wall. These repairs have corrected the seepage. This was completed in 1963.

7) The valve located in the valve box on the upstream slope of the dam was reportedly repaired or replaced. This probably was completed in 1963 in association with the reservoir drawdown.

2.3 OPERATION

Operation records are not available for this dam. The reservoir is usually at the spillway crest level.

2.4 EVALUATION

a. Availability - The information reviewed is readily available from PennDER's File No. 61-7. Additional information was obtained by interviewing the owner's personnel; however, this information is limited to the time period for which the personnel have been working for the owner.

b. Adequacy - The information available is adequate for a Phase I Inspection of this dam; however, it would be advantageous to the owner to pursue through the records of the State School facility and the original design file of the facility to locate any information concerning the original design which may be pertinent to the future operation and safety of the dam. This information should be properly recorded on engineering drawings for future reference.

c. Validity - There is no reason to doubt the validity of the information reviewed.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The dam and its appurtenant structures were found to be in fair overall condition at the time of inspection. A dusting of snow had fallen during the weekend preceding the inspection, but this snow had melted by the time of the inspection on 10 December 1979. Noteworthy deficiencies observed during the visual inspection are described briefly in the following paragraphs. The complete visual inspection check list, field sketch, top of dam profile, and typical cross-section are given in Appendix A.

b. Dam - The upstream slope is fairly steep above the reservoir level and minor erosion or surface sloughing has occurred. A tree was observed on the upstream face to the right of the spillway. Also, the upstream slope is covered with shrubs; however, the root system on these shrubs does not present the potential problem that the tree presents. A rodent hole was observed to the right of the valve box beneath the base of one of these shrubs. A sewerline was observed along the downstream edge of the roadway on the crest. This sewer was installed approximately 5.5 feet below the top of dam elevation.

A depression was observed at approximate Station 1+40 (stationing used during the visual inspection is shown on the field sketch in Appendix A). This depression was 11 feet by 12 feet and was 12 inches below the rest of the slope at the deepest point. According to the owner's personnel, a valve on the water supply pipe used to be at the same location as the depression but was later removed. He felt the depression may be the result of removing the valve. It was also observed that an 8 inch steel pipe exits through the stone masonry wall of the spillway discharge channel approximately in line with the depression observed on the dam. This pipe is probably the abandoned blow-off from the water supply pipe which was used in conjunction with the above mentioned valve. Depending on whether the pipe was plugged or left open when the valve was removed, this pipe could carry some of the soil material from the embankment with any seepage/drainage that entered the open ended pipe. It was observed at the discharge end of this pipe

in the spillway channel that a very minor amount (less than 0.1 g.p.m.) of water was flowing from the pipe. The third and final possible reason for the depression is that poor filling and compaction procedures were used during the flattening of the downstream slope in 1965 and this depression occurred as a result of those procedures.

A depression was also observed at the junction of the embankment and the right spillway training wall (see field sketch). This depression was 5.5 feet by 7 feet and 4 feet deep. The owner's personnel reported that seepage had been occurring along this wall previously (prior to repairs in 1963) and this seepage passed through the masonry stone spillway training wall at this approximate location. The repairs performed have apparently corrected the seepage problem but the depression was not filled.

Adjacent to the right spillway training wall just downstream from the 8.5 foot drop some sloughing and erosion has occurred on the downstream slope. This area was apparently constructed overly steep during the flattening of the downstream slope.

c. Appurtenant Structures - The spillway structure appeared to be in reasonable condition. The right training wall was slightly tilted at the same approximate location as the erosion and sloughing mentioned above under paragraph 3.1.b. By partially cutting back the embankment slope at this location, some of the pressure on the wall may be reduced. Also, the joints in the masonry stone spillway walls appeared to be in need of repointing. This will help prevent the migration of embankment material into the spillway and help prevent water from entering the embankment. A small amount of silt and trash was present at the entrance to the spillway.

The valve box on the upstream slope was partially covered by embankment materials and the inspection cover could not be opened. The valve reportedly has not been operated for several years (estimated time it was last operated was in 1963 for the reservoir drawdown). The intake was submerged and details concerning its construction were not available. The discharge end of the 16 inch corrugated metal pipe was in an acceptable condition. It is estimated that the pipe through the embankment

is not a 16 inch corrugated pipe because of the date of construction of the dam and the fact that a valve is located at the midpoint in the embankment. (Note: During a later phone call to the owner's representative, the size and type of the pipe was discussed and the owner's representative contacted an individual who worked on the valve in 1963. He recalled that the pipe was an 8 or 10 inch cast-iron pipe.)

d. Reservoir Area - The reservoir slopes are relatively flat. The reservoir has been dredged a number of times to remove the sedimentation.

e. Downstream Channel - The downstream channel passes through a stone arch culvert approximately 1000 feet below the dam. This culvert is large enough that it will not restrict the flows from the dam. Located an additional 2300 feet downstream are approximately 25 homes which may suffer economic damage if the dam should fail. However, more potential damage from Little Sandy Creek flood flows is present because these homes are located in the floodplain of Little Sandy Creek. The confluence of Little Sandy Creek and Piffer Run (the local name for the tributary to Little Sandy Creek from the dam) is 2500 feet downstream from the dam. One mile downstream from the dam is the confluence of Little Sandy Creek and Sandy Creek.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no formal written procedures in the event of impending failure of the dam. It is recommended that formal emergency procedures be prepared, prominently displayed, and furnished to all operating personnel.

4.2 MAINTENANCE OF DAM

Maintenance of the dam is the responsibility of the engineering department of the state school and hospital. The embankment is kept well cut during the summer and the shrubs are trimmed when necessary. However, inspection procedures for evaluating the necessity of maintenance and formal records of any maintenance previously performed were not available. It is recommended that formal inspection, maintenance, and record procedures be developed and implemented.

4.3 MAINTENANCE OF OPERATING FACILITIES

Maintenance of the operating facilities has been performed when it has become necessary to use the facilities. However, procedures for evaluating the operability and condition of this facilities should be developed and implemented, and the facilities operated on at least an annual basis.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning procedure in the event of a dam failure. An emergency warning procedure should be developed.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

It is not known whether the valve on the outlet pipe is operational. The condition and operability should be checked.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data - No hydrologic or hydraulic design calculations are available for Polk Dam.

b. Experience Data - No information concerning the effects of significant floods on the dam is available.

c. Visual Observation - At the time of the inspection, no conditions were observed which would seriously affect the functioning of the spillway or dam during a flood event.

There is one low spot on the dam crest (Station 2+00) which is approximately 0.3 foot below the average crest elevation.

d. Overtopping Potential - Polk Dam is a "Small" size - "Significant" hazard dam requiring evaluation for a spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF). Because the potential damage resulting from failure of the dam is on the low end of the "Significant" hazard - "Small" size categories, the 100-year flood was chosen as the SDF.

Using regression equations developed by the Pittsburgh District of the Corps of Engineers, the peak inflow to the impoundment for the 100-year flood was calculated to be 1070 c.f.s. The run-off hydrograph for this event was then established using the Soil Conservation Service's (SCS) dimensionless unit hydrograph approach. For a curve number of 73, a peak inflow of 1043 c.f.s. was obtained for the 100-year flood. This peak flow is within 3 percent of the peak flow computed previously; therefore, this hydrograph was used for the hydrologic analysis.

The hydraulic capacity of the dam, reservoir, and spillway was then assessed by utilizing the U.S. Army Corps of Engineers Flood Hydrograph Package, HEC-1 DB.

Analyses of the dam and spillway shows that the dam will be overtopped by a maximum of 0.61 foot for a duration of 1.50 hours.

e. Spillway Adequacy - As outlined in the above analyses, the spillway will not pass the SDF without overtopping the dam; therefore, the spillway is considered inadequate.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - There were no structural inadequacies noted during the visual inspection that cause immediate concern for the structural stability of the dam. The localized sloughing and erosion adjacent to the spillway structure can be decreased or stopped by cutting back the slope in this immediate area. This would also reduce the pressure on the spillway wall which has become slightly tilted at this location. The two depressions on the dam do not cause immediate concern for the structural stability because there is no evidence that piping was the cause. It is recommended that these depressions be properly filled and observed periodically in the future to determine if they will reoccur.

b. Design and Construction Data - No design or construction data were available for review. Although it is difficult to assess the structural stability of the embankment without any knowledge of the construction materials and methods, for this particular dam, with the 4H:1V downstream slope and history of satisfactory performance of the upstream slope under previous reservoir drawdowns and the fact that no indications of instability were observed during the field inspection; further assessments of the stability are not considered necessary for this Phase I Inspection Report. However, should future inspections observe signs of distress or seepage which would affect the structural stability of the dam, additional evaluations and corrective measures may become necessary.

c. Operating Records - No operating records are available. Nothing in the procedures described by the owner's representative indicate concern relative to the structural stability of the dam.

d. Post-Construction Changes - No changes adversely affecting the structural stability of the dam have been performed.

e. Seismic Stability - The dam is located in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended

Guidelines for Safety Inspection of Dams." This is a zone of minor seismic activity. Therefore, further consideration of the seismic stability is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety - Polk Dam was found to be in fair overall condition at the time of inspection. Polk Dam is a "Significant" hazard - "Small" size dam requiring a spillway capacity in the range of the 100-year flood to the 1/2 PMF. The 100-year flood was chosen as the SDF. As presented in Section 5, the spillway and reservoir are not capable of passing the 100-year flood without overtopping the dam. During the 100-year flood, the dam is overtopped by a maximum of 0.61 foot for a duration of 1.50 hours. Therefore, the spillway is considered "inadequate."

The depressions and localized sloughing do not indicate immediate concern for the continued structural stability of the dam. It is recommended that the depressions be properly filled and the downstream slope adjacent to the spillway be slightly cut back at the slough. All three areas should be examined in future inspections and their condition recorded.

b. Adequacy of Information - The information available and the observations made during the visual inspection are considered sufficient for this Phase I Inspection Report.

c. Urgency - The owner should initiate the action discussed in paragraph 7.2 without delay and immediately initiate the further evaluation discussed in paragraph 7.1.d.

d. Necessity for Additional Data/Evaluation - The hydraulic/hydrologic analysis performed in connection with this Phase I Inspection Report has indicated the need for additional spillway capacity. It is recommended that the owner immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed certain items of remedial work which should be performed by the owner without delay. Item 1 below should be completed by a qualified pro-

fessional engineer experienced in the design of hydraulic and appurtenant structures for earth dams. These include:

1) The owner should immediately initiate an engineering study to further evaluate the spillway capacity and develop recommendations for remedial measures to reduce the overtopping potential of the dam.

2) Fill the two depressions on the downstream slope of the dam and monitor these areas in future inspections to determine if additional remedial work is necessary.

3) The sloughing and erosion of the downstream slope adjacent to the spillway structure should be repaired. It is recommended that the slope be partially cut back in this area so as to decrease or stop the sloughing and erosion.

4) After the sloughing and erosion noted in item 2 is repaired, the slightly tilted spillway wall should be repaired.

5) The masonry in the spillway structure should be repointed to prevent the migration of embankment material into the spillway and the infiltration of water from the spillway into the embankment.

6) Remove the silt and trash at the entrance to the spillway.

7) Fill the rodent/animal burrow in the embankment.

8) The condition and operability of the outlet works should be examined and any necessary repairs performed.

9) The tree to the right of the spillway on the upstream slope should be removed and the excavated area regraded and compacted.

In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented.

APPENDIX A

VISUAL INSPECTION CHECK LIST, FIELD SKETCH, TOP OF DAM PROFILE, AND TYPICAL CROSS-SECTION

Check List
Visual Inspection
Phase 1

Name of Dam Polk Dam County Venango State PA Coordinates Lat. N 41°22.5'

NDI # PA 00253
PennDER # 61-7

Long. W 79°55.8'

Date of Inspection 10 December 1979 Weather Sunny, mild* Temperature 35-40° F.

*A light dusting of snow occurred on the weekend before the inspection but most of this had melted prior to the inspection.

Pool Elevation at Time of Inspection 1093.4** ft. M.S.L. Tailwater at Time of Inspection 1074.4** ft. M.S.L.

**All elevations referenced to bridge deck over spillway, Elevation 1100.0 ft.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Ulinski
Wayne D. Lasch
Larry A. Diday

Owner's Representatives:

Mr. Adam Gazek (part-time)
Mr. Harry Daye (part-time)

James G. Ulinski Recorder

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: POLK DAM

NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: POLK DAM

NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT		
MONOLITH JOINTS		
CONSTRUCTION JOINTS		

EMBANKMENT

Name of Dam POLK DAM

NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	A depression 12 in. deep in the embankment was observed at Station 1+40 (see Field Sketch) on the downstream slope. There are several possible reasons for this (1) A waterline valve was removed from this location, (2) A void was left in the slope flattening fill in 1965, (3) A hole was left in the abandoned waterline in the embankment.	The depression should be filled in and graded level with the rest of the slope and observed in the future to see if the depression reoccurs.

EMBANKMENT

Name of Dam POLK DAM
NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The vertical and horizontal alignment of the crest was acceptable. The lowest spot (El. 1099.7 ft.) on the crest was at approximate Station 2+00 (see Field Sketch). This is only 0.3 ft. below the rest of the top of dam.	No recommended action.
RIPRAP FAILURES	The sandstone rock riprap on the upstream crest has become partially reworked and covered. The upstream slope has some minor erosion; however, this is thought to be the result of slope angle and not the riprap.	No recommended action.
RODENT HOLES/ ANIMAL BURROWS	A rodent hole/animal burrow was observed on the upstream slope to the right of the valve box and under a bush (see Field Sketch).	The rodent hole/animal burrow should be filled.

EMBANKMENT

Name of Dam POLK DAM

NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems were observed on the left and right abutments. Some erosion has occurred along the junction of the right downstream spillway training wall and the embankment (see Field Sketch for location).	The eroded areas should be filled/repaired.
ANY NOTICEABLE SEEPAGE	None observed	
STAFF GAGE AND RECORDER	None	
DRAINS	None	

OUTLET WORKS

Name of Dam: POLK DAM
NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The 16 in. C.M.P. outlet pipe exiting into the downstream channel was in good condition. The condition of the 8 or 10 in. cast-iron pipe through the embankment is not known.	
INTAKE STRUCTURE	Submerged - no information available	
OUTLET STRUCTURE	No outlet structure as such, the 16 in. C.M.P. exits through the masonry stone wall of the downstream channel. No problems observed at this location.	
OUTLET CHANNEL	No outlet channel, the pipe discharges into the downstream channel.	
EMERGENCY GATE	The valve box on the upstream slope was not in a condition where the inspection plate could be opened. The valve has reportedly not been used since the last drawdown of the reservoir in 1963.	The owner should check the operability of the valve and perform any necessary maintenance.

UNGATED SPILLWAY

Name of Dam: POLK DAM
NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The spillway structure consists of masonry stone (sandstone) blocks.	Repoint the joints of the spillway structure.
APPROACH CHANNEL	A small amount of silt and trash was present at the entrance to the spillway.	Remove the silt and trash at the entrance to the spillway.
DISCHARGE CHANNEL	A relatively insignificant amount of debris and silt has collected in the discharge channel.	
BRIDGE AND PIERS	A two lane road constructed on a concrete bridge deck runs over the spillway. The bridge deck is in good overall condition. The masonry blocks forming the bridge piers and spillway walls have undergone some minor shifts but the overall alignment and condition is good.	

GATED SPILLWAY - Not Applicable

Name of Dam: POLK DAM

NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		

INSTRUMENTATION - None

Name of Dam: POLK DAM

NDI # PA 00253

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS		
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER		

RESERVOIR

Name of Dam: POLK DAM
NDI # PA 00253

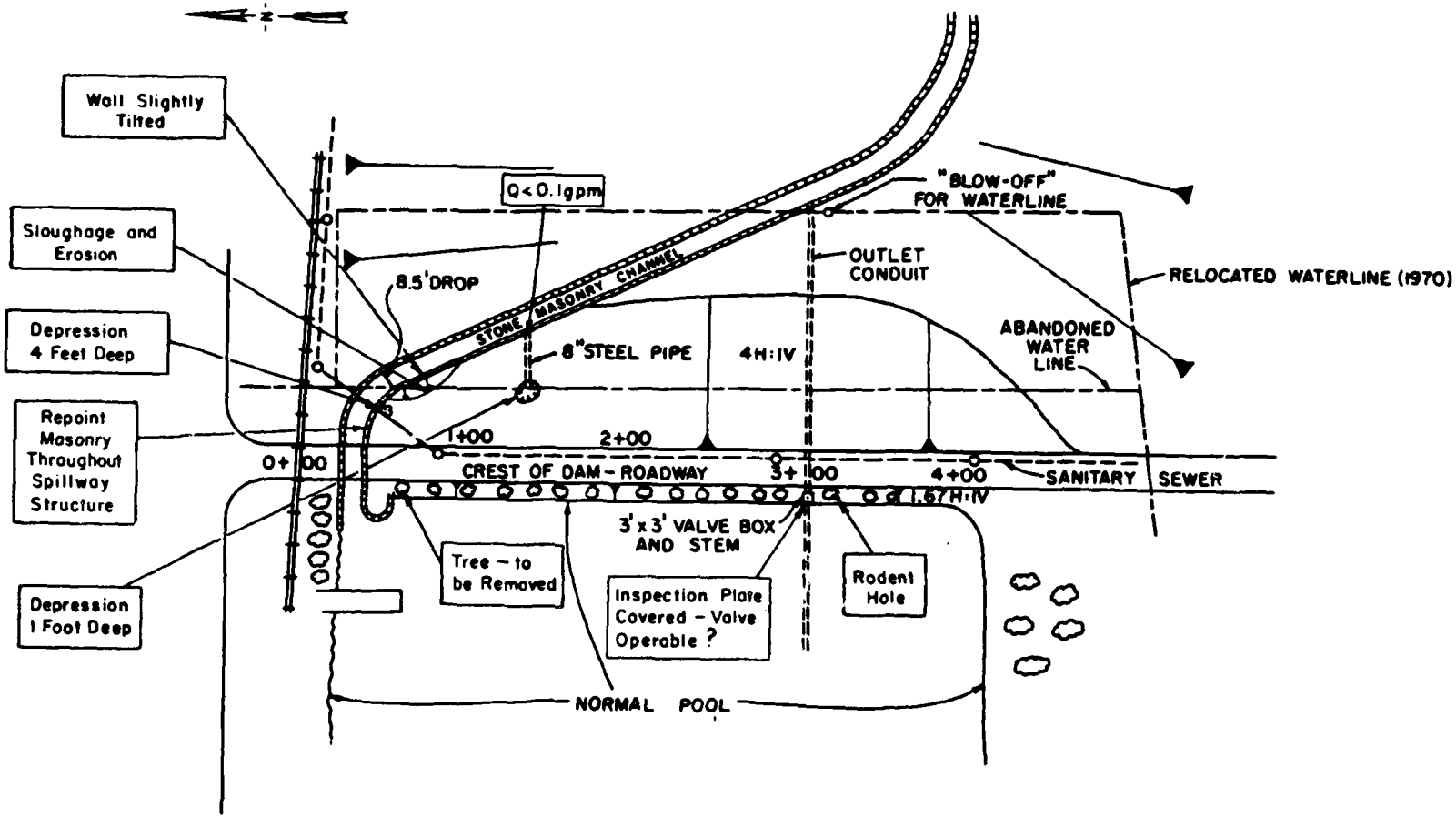
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The reservoir slopes are mild with no evidence of instability.	
SEDIMENTATION	The amount of sediment in the reservoir is unknown. The sediment would not impede the current uses of the reservoir.	

DOWNSTREAM CHANNEL

Name of Dam: POLK DAM

NDI # PA 00253

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The masonry stone discharge channel from the spillway continues for approximately 270 ft. straight in plan view from the 8 ft. drop before turning downstream. At this approximate location, the masonry stone lining stops and the natural streambed begins. An additional 700 ft. downstream is a stone arch culvert which is capable of passing the flows from the dam.	
SLOPES	The side slopes are relatively flat and the channel slope is mild.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately 2300 ft. downstream from the dam there are approximately 25 homes which may suffer economic damage in the event of a dam failure; however, loss of life due to the dam failure is unlikely. These homes also appear to be located within the floodplain of Little Sandy Creek.	



FIELD SKETCH

POLK DAM

NDI NO. PA 00253

PennDER NO. 61-7

INSPECTED 10 DECEMBER 1979

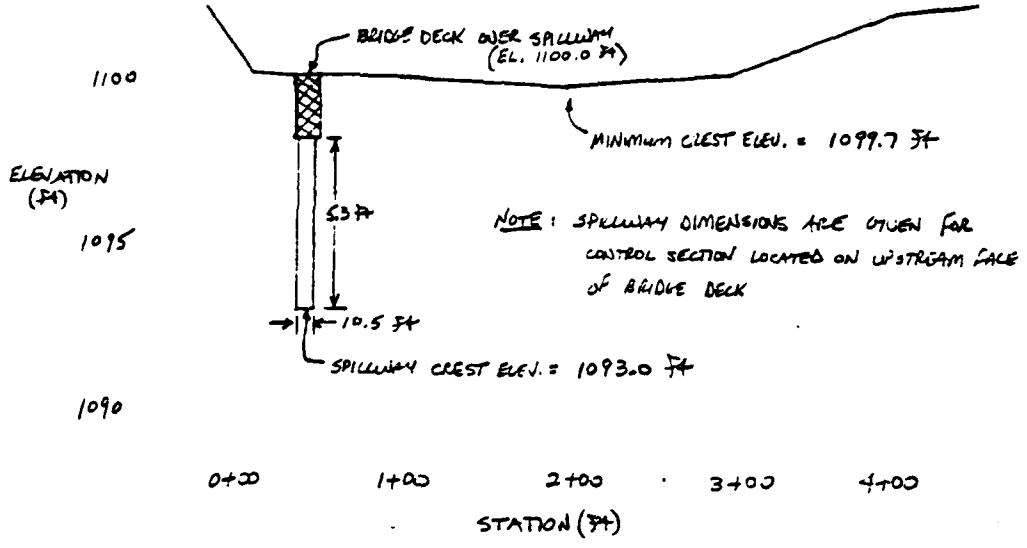
SCHEMATIC - NOT TO SCALE

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS
18 February 1980
Box 280
Beaver, Pa. 15009

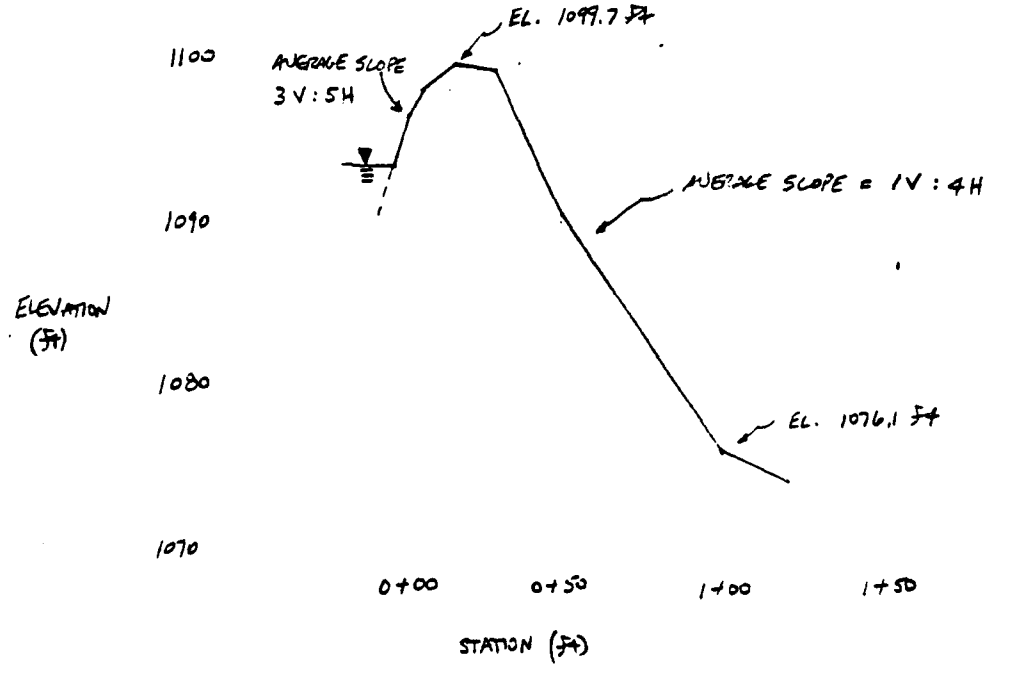
POLK DAM
TOP OF DAM PROFILE
TYPICAL CROSS-SECTION

DATE OF INSPECTION - 10 December 1979

CREST PROFILE



CROSS SECTION AT STATION 2+00



APPENDIX B

ENGINEERING DATA CHECK LIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: POLK DAM

ITEM	REMARKS
PLAN OF DAM	See Plate 3 and the Field Sketch of this report.
REGIONAL VICINITY MAP	The USGS 7.5 minute topographic quadrangles, Polk and Utica, Pennsylvania, where used to prepare the vicinity map which is enclosed in this report as the Location Plan (Plate 1).
CONSTRUCTION HISTORY	No construction history is known. The state facilities at the site were constructed circa 1895 and it is possible that the dam was constructed for water supply at that time.
TYPICAL SECTIONS OF DAM	See Appendix A for typical cross-section.
HYDROLOGIC/HYDRAULIC DATA	No information available
OUTLETS - PLAN	See Field Sketch for location
- DETAILS ,	
CONSTRAINTS , and DISCHARGE RATINGS	No information available
RAINFALL/RESERVOIR RECORDS	None available

Name of Dam: POLK DAM

NDI # PA 00253

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available, see Appendix F for regional geology.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	No information available

Name of Dam: POLK DAM
NDI # PA 00253

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	The road which is located on the crest of the dam was originally brick or block-lined; the road currently consists of oil and chip. The downstream slope was flattened in 1965. In 1970 a waterline which runs parallel to the crest in the downstream slope was replaced by a waterline downstream from the toe. The pool was partially drawdown in 1946 or 1947. The reservoir was dredged by Hasbrook Construction Company in the summer of 1963.
HIGH POOL RECORDS	No information available
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Inspections of the dam were performed on (1) 20 August 1919, (2) 2 May 1924, (3) 4 August 1925, (4) 6 October 1965, and (5) 19 January 1966. These inspection reports are available in the *PennDER file*.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	The engineering department of the state hospital has maintained the dam on an as-needed basis. Formal records of the maintenance are not available.

Name of Dam: POLK DAM

NDI # PA 00253

ITEM	REMARKS
SPILLWAY PLAN	See Field Sketch and Plate 3.
SECTIONS and DETAILS	No information available
OPERATING EQUIPMENT PLANS & DETAILS	No information available

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.43 sq.mi. (primarily forests and pastures)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY: 1093.0 ft. (51.6 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1099.7 ft. (115.0 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1099.7 ft. (minimum crest elevation)

SPILLWAY: Principle

a. Crest Elevation 1093.0 ft.
b. Type Open channel
c. Width of Crest Parallel to Flow 25 ft.
d. Length of Crest Perpendicular to Flow 10.5 ft.
e. Location Spillover Left abutment
f. Number and Type of Gates None

OUTLET WORKS: Facilities for dewatering reservoir

a. Type 8 or 10 in. cast-iron pipe; 16 in. C.M.P. at exit
b. Location Station 3+08 on Field Sketch
c. Entrance Inverts Unknown
d. Exit Inverts El. 1079.68 ft.
e. Emergency Drawdown Facilities Valve located inside 3 ft. x 3 ft. concrete box on upstream slope

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE No records available

APPENDIX C

PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View - View of the Dam from the Right Abutment. The Spillway is Located at the Left Abutment.

Photograph Location Plan

Photo 1 - View of the Upstream Slope of Dam from the Right Shoreline

Photo 2 - View of the Downstream Slope of Dam from the Right Abutment

Photo 3 - View of the Entrance to the Spillway

Photo 4 - View of the Spillway and Bridge Looking Upstream

Photo 5 - View of the Spillway Discharge Channel Looking Upstream

Photo 6 - View of the Discharge Channel Looking Upstream (Note: Blow-off valve in left of photo is the same as shown in Photo 8)

Photo 7 - View of Outlet Works Valve Box on Upstream Slope

Photo 8 - View of Outlet Pipe Discharge Location into Downstream Channel (Note: The corrugated metal pipe exiting through the channel wall. The blow-off at the left of the photo is for a water supply pipe which passes downstream from the dam)

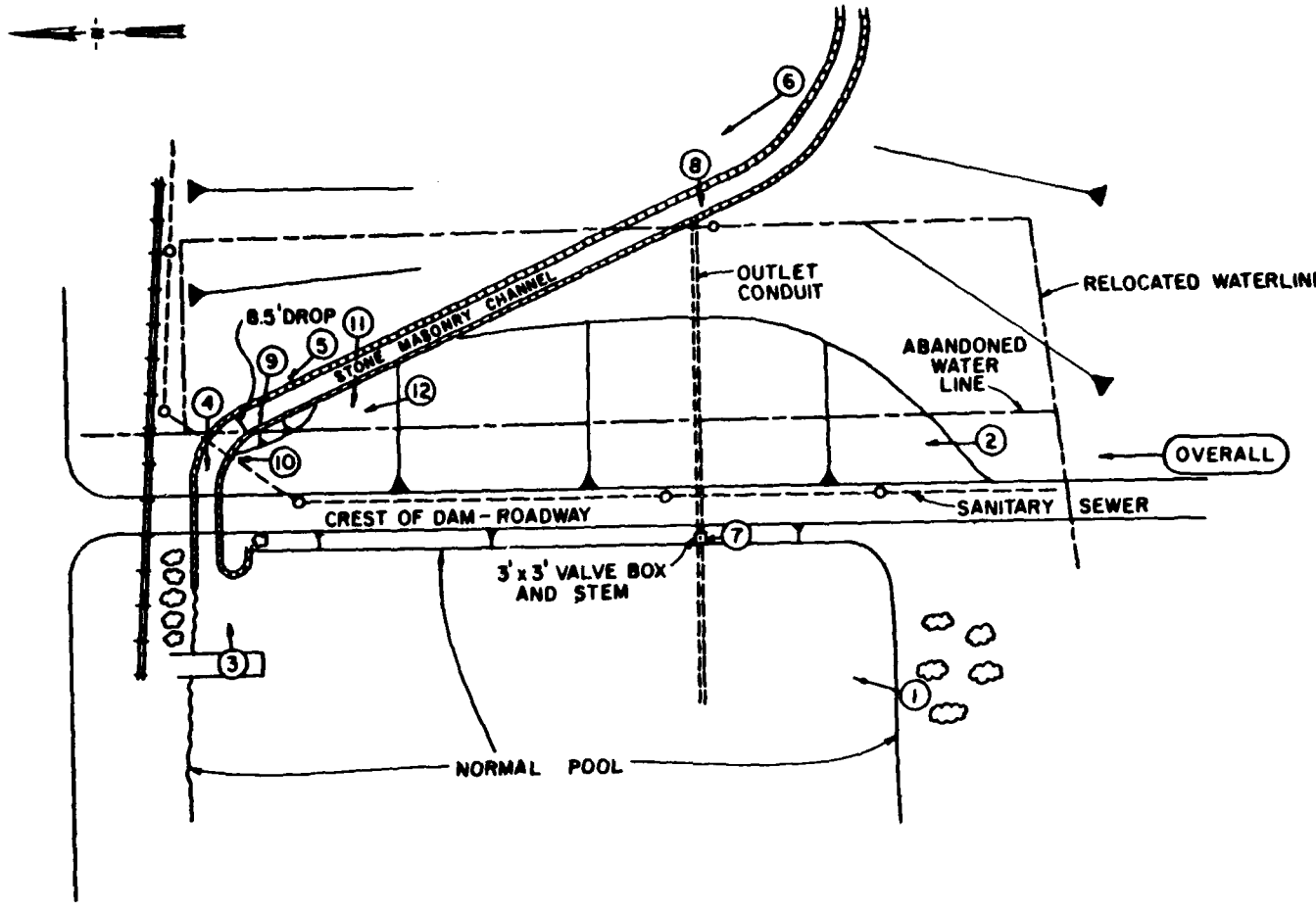
Photo 9 - View of Eroded Area on the Right Downstream Side of the Spillway Structure

Photo 10 - View of Sinkhole on the Right Side of the Spillway Training Wall

Photo 11 - View of Depression on the Downstream Slope (Note: cast-iron pipe exiting at base of wall where the ruler is located)

Photo 12 - Another View of the Depression on the Downstream Slope (Where ruler is located)

Note: Photographs were taken on 10 December 1979.



PHOTOGRAPH LOCATION PLAN

POLK DAM

NDI NO. PA00253

PennDER NO. 61-7

PHOTOGRAPHS TAKEN 10 DECEMBER 1979

POLK DAM

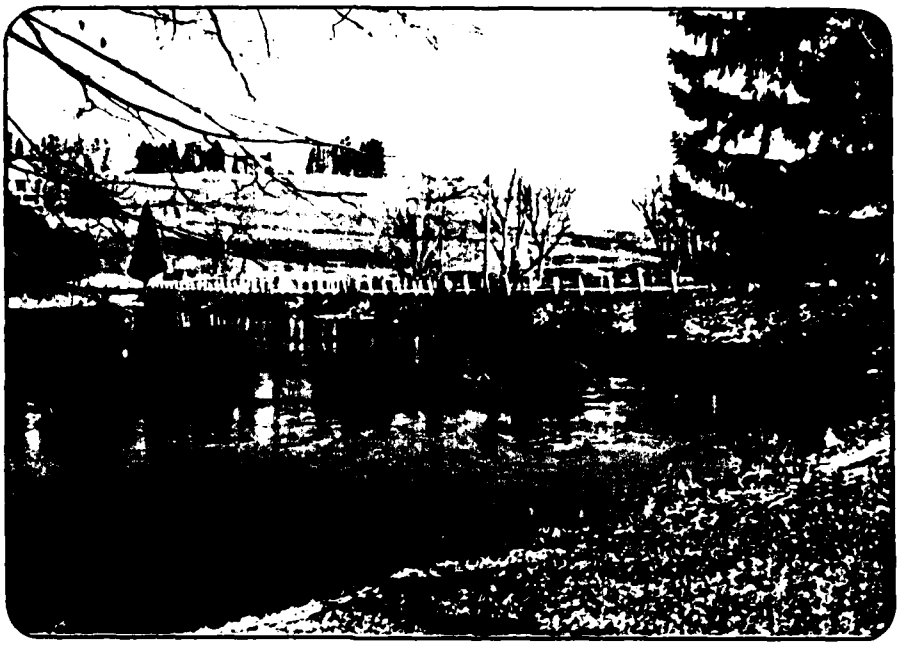


PHOTO 1. View of the Upstream Slope of Dam from the Right Shoreline

PHOTO 2. View of the Downstream Slope of Dam from the Right Abutment

PHOTO 3. View of the Entrance to the Spillway

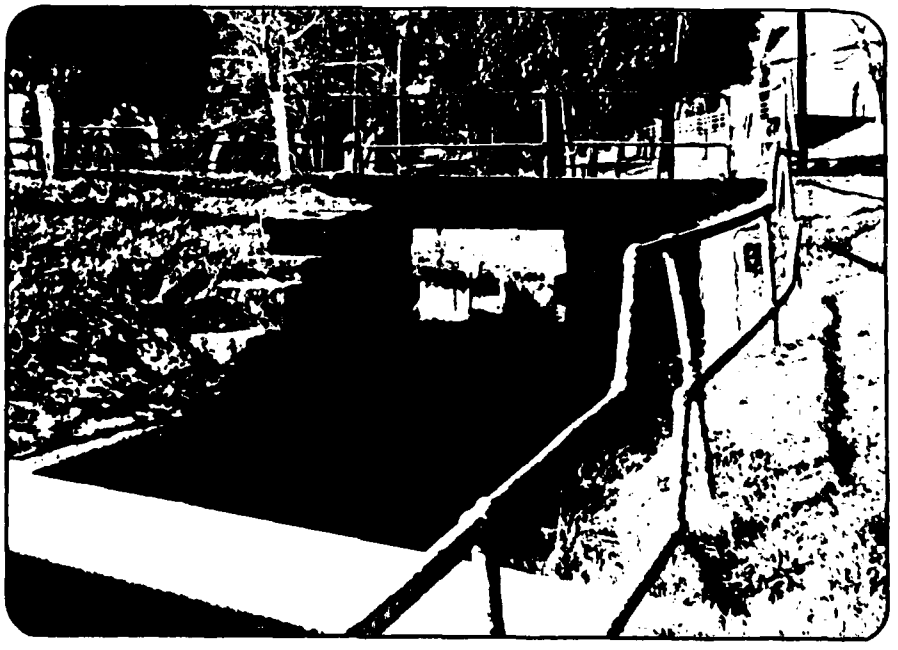


PHOTO 4. View of the Spillway and Bridge Looking Upstream

PHOTO 5. View of the Spillway Discharge Channel Looking Upstream

PHOTO 6. View of the Discharge Channel Looking Upstream

PHOTO 7. View of Outlet Works Valve Box on Upstream Slope

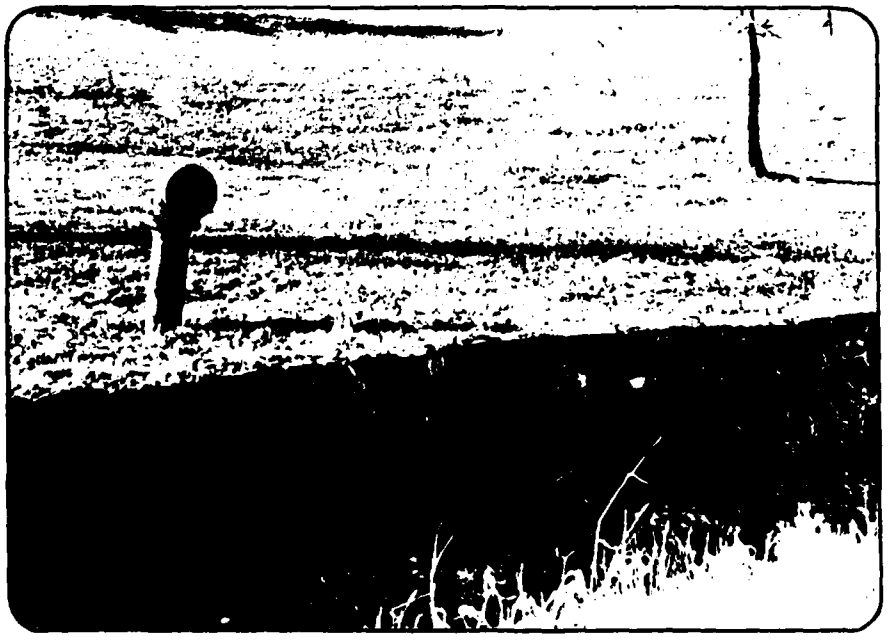


PHOTO 8. View of Outlet Pipe Discharge Location
(The outlet pipe is the corrugated metal pipe exiting through the channel wall)

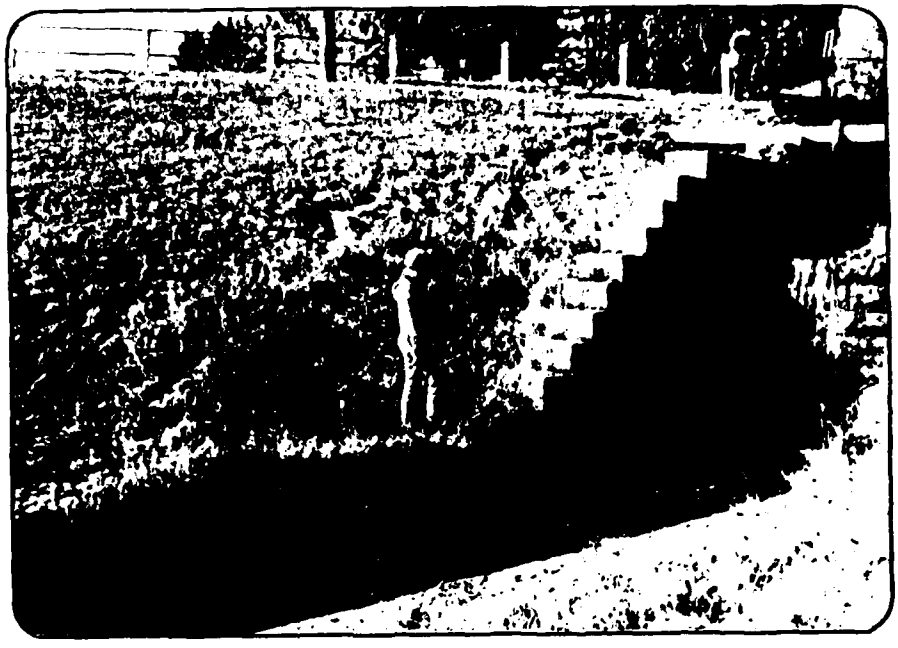


PHOTO 9. View of Eroded Area on the Right Downstream Side of the Spillway Structure

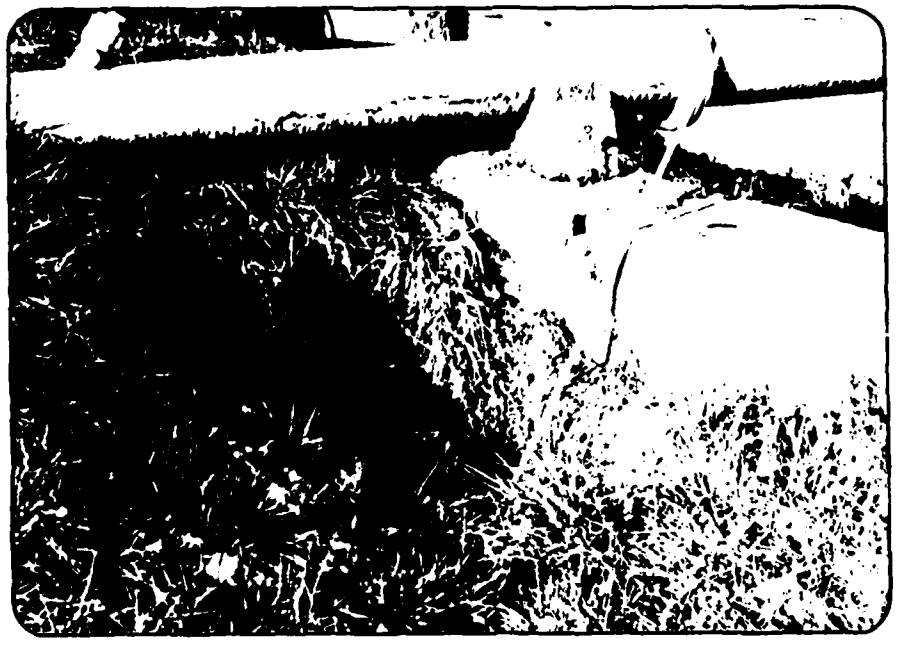


PHOTO 10. View of the Sinkhole on the Right Side of the Spillway Training Wall

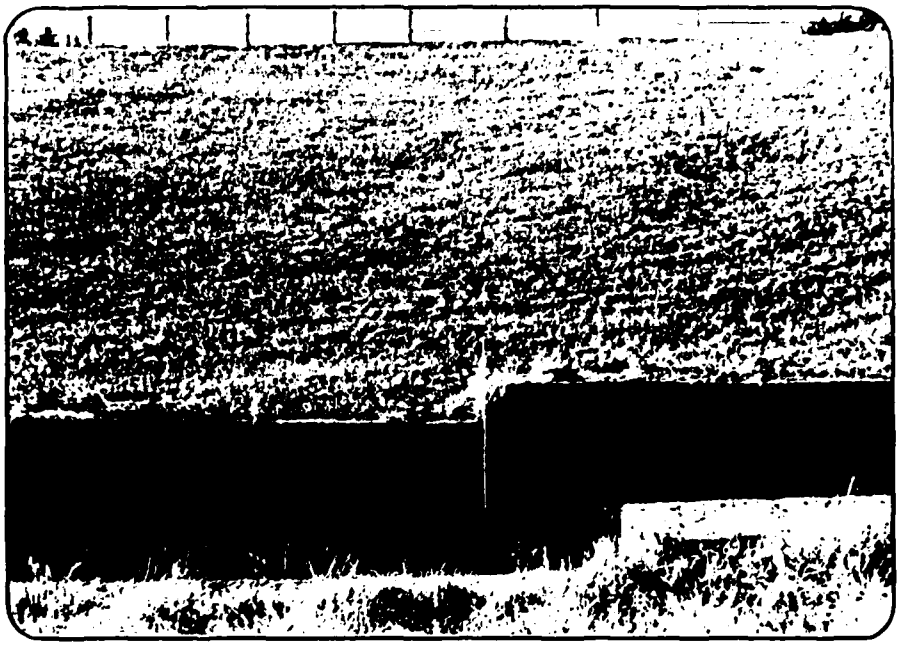


PHOTO 11. View of Depression on the Downstream Slope (Note cast-iron pipe exiting at base of wall where the ruler is located.)

PHOTO 12. Second View of the Depression on the Downstream Slope (where ruler is located)

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject POLK DAM S.O. No.
APPENDIX D - HYDROLOGIC AND Sheet No. of
HYDRAULIC CALCULATIONS Drawing No.
Computed by Checked by Date

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: POLK DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 23.2 INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	POLK DAM				
Drainage Area (square miles)	1.43				
Cumulative Drainage Area (square miles)	1.43				
Adjustment of PMF for Drainage Area (%)[2]	Zone 2				
6 Hours	117				
12 Hours	127				
24 Hours	141				
48 Hours	151				
72 Hours					
Soil Conservation Service Hydrograph Parameters					
Tc (hours)					
Lag (hours)					
Curve Number	73				
Peak Discharge (cfs)	1,043				
Estimated Peak Discharge by the Pittsburgh District Method (cfs)	1,070				
Spillway Data					
Crest Length (ft)	10.5				
Freeboard (ft)	5.3				
Discharge Coefficient	(Spillway discharge rating developed				
Exponent	on sheet 5)				

Note: 100-year rainfall was obtained from TP-40[3]

[1] Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

[2] Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

[3] TP-40 Rainfall Frequency Atlas of the United States (Table 3 and Charts 1-49), United States Weather Bureau, 1963.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject POLK DAM — S.O. No. ____
HYDRAULIC DATA — Sheet No. 2 of 13
Drawing No. ____
Computed by WLL — Checked by WCS — Date 2-19-80

STORAGE CALCULATIONS :

AREA VS ELEVATION DATA : (MEASURED FROM QUADS)

ELEVATION (Ft)	SURFACE AREA (ACRES)
1093.0	7.65
1100.0	11.63
1120.0	115.71

NOTE : NORMAL POOL ASSUMED TO BE AT ELEVATION of CONTROL SECTION IN SPILLWAY CREST (1093.0 Ft)

NORMAL POOL STORAGE :

STORAGE VOLUME = $V_{NP} = \frac{h}{3}\left(A_1 + A_2 + \sqrt{A_1 A_2}\right)$

h = ESTIMATED AVERAGE DEPTH = 7.0 Ft

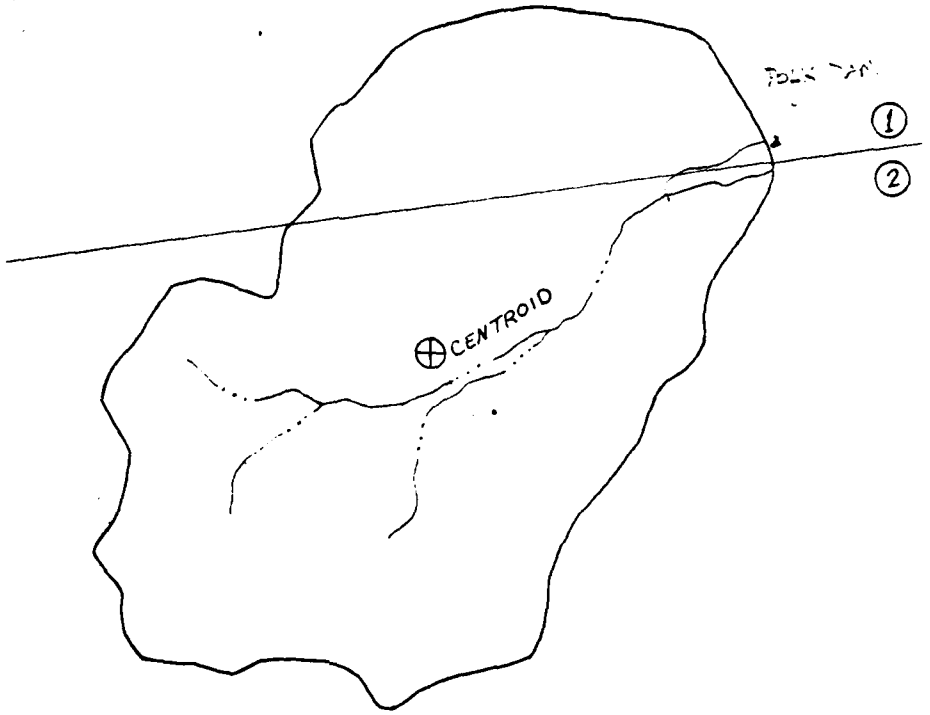
A_1 = SURFACE AREA of NORMAL POOL = 7.65 Ac.

A_2 = SURFACE AREA of RESERVOIR BOTTOM = 7.10 Ac (ESTIMATED FROM AVERAGE DEPTH AND RESERVOIR SIDE SLOPES)

NORMAL POOL STORAGE = $V_{NP} = \frac{7}{3}\left(7.65 + 7.10 + \sqrt{(7.65)(7.10)}\right)$

$V_{NP} = 51.61$ Ac - Ft

TOP OF DAM STORAGE = 115.0 Ac-Ft (FROM HEC-1 ANALYSIS)



QUADS :
1. UTICA
2. POLK

SCALE : 1:24000

0 1/2 1 MILE

POLK DAM :

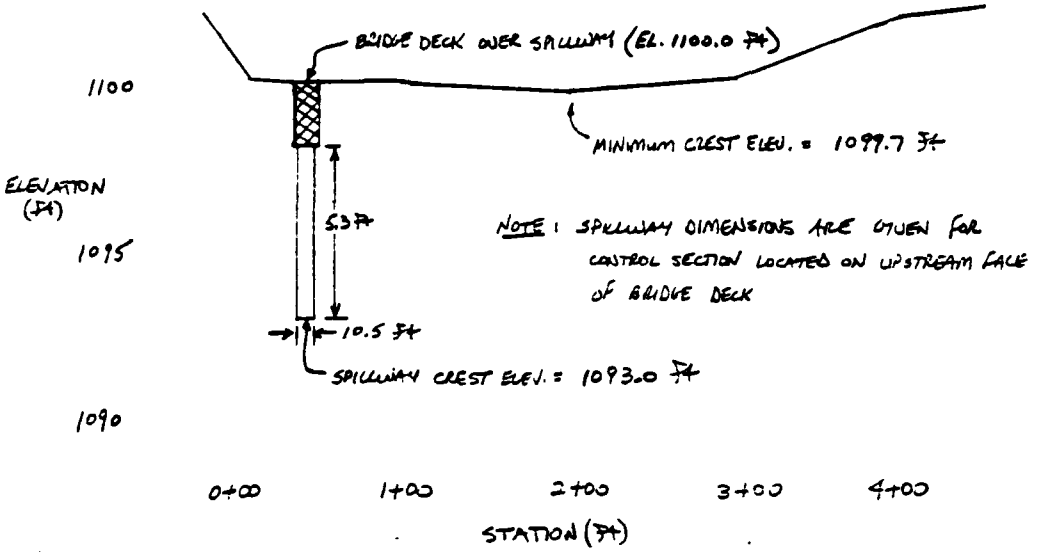
DRAINAGE AREA AND CENTROID

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

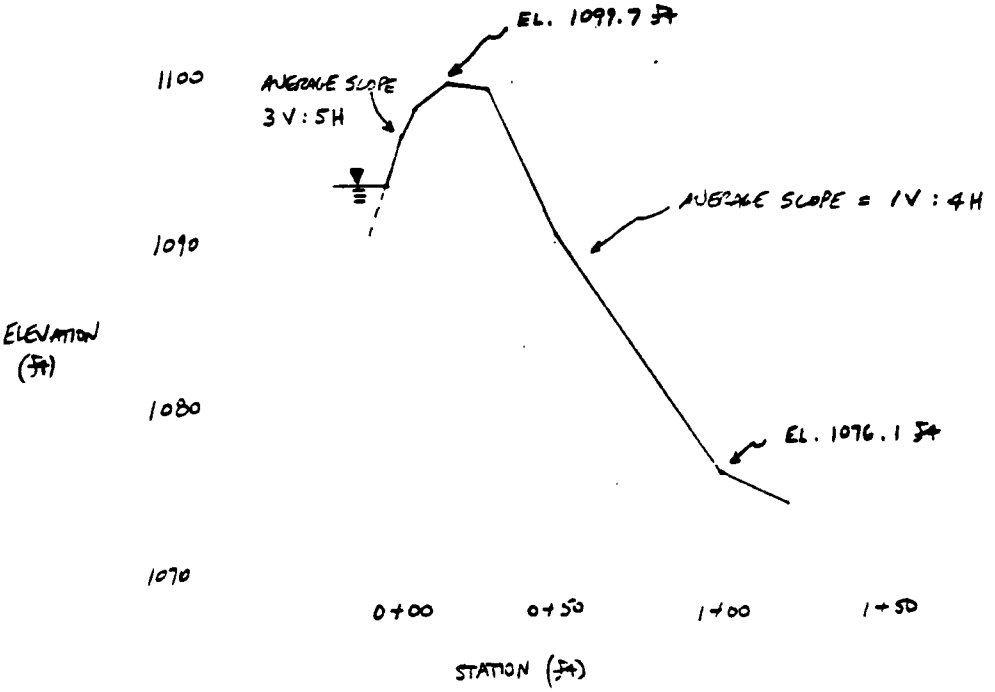
Box 280
Beaver, Pa. 15009

Subject POLK DAM
DAM CREST PROFILE AND CROSS SECTION
S.O. No.
Sheet No. 4 of 13
Drawing No.
Computed by WDC Checked by WLS Date 2-18-80

CREST PROFILE



CROSS SECTION AT STATION 2+00

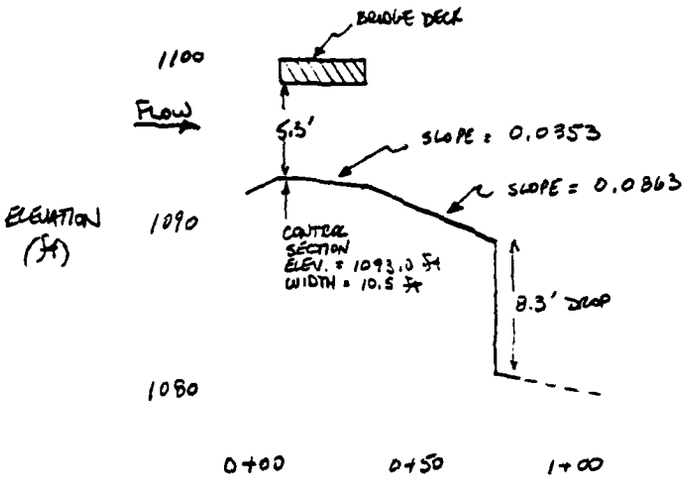


MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject POLK DAM — S.O. No.
SPILLWAY PROFILE AND — Sheet No. 6 of 13
DISCHARGE RATING — Drawing No.
Computed by WDL — Checked by LAD — Date 2-20-80

SPILLWAY PROFILE



FOR OPEN CHANNEL FLOW UNDER BRIDGE DECK, CALCULATE DISCHARGE RATING ASSUMING CRITICAL FLOW AT CONTROL SECTION : (FROM CHOW, OPEN CHANNEL HYDRAULICS, P 43)

$V = \sqrt{gD}$ D = MEAN HYDRAULIC DEPTH = $\frac{\text{FLOW AREA}}{\text{TOP WIDTH}}$

$g = 32.2\ \text{FT/SEC}^2$

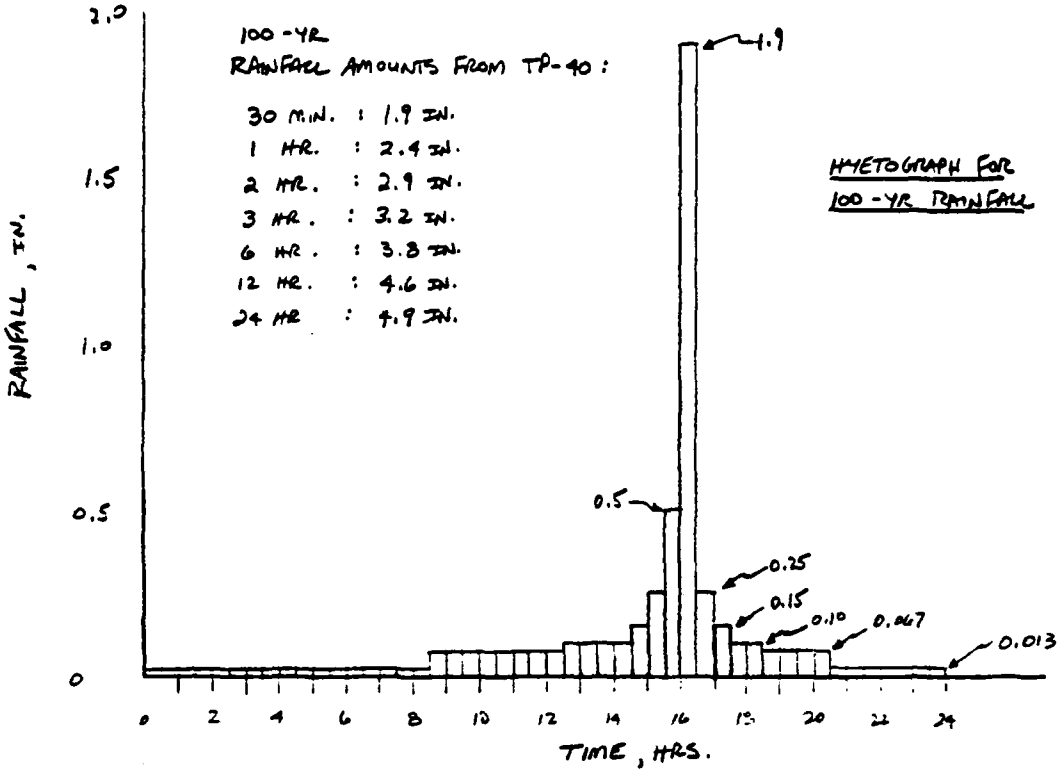
$Q = VA$ A = FLOW AREA

DEPTH (FT)	ELEVATION (FT)	V FT/SEC	A (FT^2)	Q (CFS)	$V^2/2g$	E.G.L.
0.1	1093.1	1.79	1.05	1.88	0.05	1093.15
0.5	1093.5	4.01	5.25	21.05	0.25	1093.75
1.0	1094.0	5.67	10.50	59.54	0.50	1094.50
2.0	1095.0	8.02	21.00	168.42	1.00	1096.0
3.0	1096.0	9.83	31.50	309.65	1.50	1097.50
4.0	1097.0	11.35	42.00	476.70	2.00	1099.00
5.0	1098.0	12.69	52.50	666.23	2.50	1100.50

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject POLK DAM — S.O. No.
100 - YEAR STORM DISTRIBUTION — Sheet No. 6 of 13
Drawing No.
Computed by WDL — Checked by — Date 3-3-80



RAINFALL DISTRIBUTION:
(30 MINUTE INTERVALS)

INTERVAL NUMBERS	% TOTAL RF OCCURRING IN EACH INTERVAL
1-17	0.3
18-25	1.9
26-29	2.0
30	3.1
31	5.1
32	9.5
33	38.1
34	5.1
35	3.1
36-37	2.0
38-41	1.9
42-48	0.3

TOTAL = 100%

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject POLK DAM — S.O. No.
100-YEAR DISCHARGE CALCULATION — Sheet No. 7 of 13
Drawing No.
Computed by WDL — Checked by — Date 3-24-80

THE INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD WAS CALCULATED USING MATERIAL DEVELOPED BY THE PITTSBURGH DISTRICT OF THE CORPS OF ENGINEERS FOR THE OHIO RIVER BASIN.

$$Q_{100} = 120.38 \left(D.A. \times S^{1/2} \right)^{0.74409}$$

D.A. = DRAINAGE AREA = 1.43 mi^2

S = CHANNEL SLOPE FOR THE LOWER 0.7 OF THE WATERSHED

S = 174.6 Ft/Mi

$$Q_{100} = 120.38 \left[(1.43)(174.6)^{1/2} \right]^{0.74409}$$

Q_{100} = 1072 cfs

USING ZERO LOSS RATES, A PEAK FLOW OF ONLY 478 CFS WAS OBTAINED IN THE HEC-1 DB ANALYSIS IF THE SNYDERS UNIT HYDROGRAPH PARAMETERS ORIGINALLY DERIVED FOR THIS BASIN WERE USED.

THE 100-YEAR FLOOD HYDROGRAPH IS THEREFORE COMPUTED USING THE SCS DIMENSIONLESS UNIT HYDROGRAPH APPROACH. TIME OF CONCENTRATION AND LAG TIME ARE COMPUTED AS FOLLOWS:

T_c = TIME OF CONCENTRATION = OVERLAND FLOW TIME + CHANNEL FLOW TIME

OVERLAND FLOW TIME:

DISTANCE = 1900 Ft.

SLOPE = 0.018

AVERAGE FLOW VELOCITY = 0.76 Ft/sec

(FROM FIG. 3.1, T.R. NO. 55, URBAN HYDROLOGY FOR SMALL WATERSHEDS, SCS.)

TRAVEL TIME = 2500 SEC

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

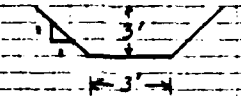
Subject POLK DAM — S.O. No.
100-YEAR DISCHARGE CALCULATION (CONTINUED) — Sheet No. 8 of 13 — Drawing No.
Computed by WDL — Checked by — Date 3-24-80

CHANNEL FLOW TIME:

DISTANCE = 6600 FT

SLOPE = 0.048

ASSUME AVERAGE CHANNEL SIZE IS:



n = 0.045

AVERAGE FLOW VELOCITY = $V = \frac{1.49}{n} R^{2/3} S^{1/2}$

$$V = \frac{1.49}{0.045}\left(\frac{(3+3)3}{3+6\sqrt{1+9}}\right)^{2/3}(0.048)^{1/2}$$

V = 6.35 FT/SEC

TRAVEL TIME = 1039 SEC

TOTAL TRAVEL TIME = T_c = 1039 + 2500 = 3539 SEC

= 0.98 HRS

LAG TIME = $0.6\,T_c$ = 0.59 HRS

WITH THE SCS PROCEDURE, A CURVE NUMBER OF 73 PRODUCED A PEAK FLOW OF 1093 CFS. THIS VALUE IS WITHIN 3% OF THE PREVIOUSLY COMPUTED PEAK FLOW OF 1072 AND IS WITHIN THE 10% LIMIT SUGGESTED BY CORPS GUIDELINES.

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
  MBJ UPDATE         04 JUN 79
**********************************
    1              A1       NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
    2              A2       HYDROLOGIC AND HYDRAULIC ANALYSES OF POLK DAM
    3              A3       UNIT HYDROGRAPH BY SCS METHOD
    4              B     300        0       30        0        0        0        0        0       -4        0
    5              B1      5
    6              J       1        1        1
    7              J1      1
    8              K       0        1                                          1
    9              K1       RUNOFF HYDROGRAPH TO DAM
   10              M       0        2     1.43                                                    1
   11              O      48      4.9
   12              O1 0.003    0.003    0.003    0.003    0.003    0.003    0.003    0.003    0.003    0.003
   13              O1 0.003    0.003    0.003    0.003    0.003    0.003    0.003    0.014    0.014    0.014
   14              O1 0.014    0.014    0.014    0.014    0.014    0.02     0.02     0.02     0.02     0.031
   15              O1 0.051    0.095    0.381    0.051    0.031    0.02     0.02     0.014    0.014    0.014
   16              O1 0.014    0.003    0.003    0.003    0.003    0.003    0.003    0.003
   17              T                                                          -1       -73
   18              W2          0.59
   19              X   -1.5    -0.05      2.0
   20              K       1        2                                          1
   21              K1       ROUTING FOR POLK DAM
   22              Y                                 1        1
   23              Y1      1                                          -1093.0       -1
   24              Y41093.0 1093.15 1093.75 1094.50 1096.00 1097.50  1098.0   1099.0
   25              Y5      0     1.88    21.05    59.54   168.42   309.65   315.00   315.00
   26              $A   7.10     7.65    11.63   115.71
   27              $E1086.0  1093.0   1100.0   1120.0
   28              $$1093.0
   29              $D1099.7     3.08      1.5    292.0
   30              $L      0      105      175      235      290      312
   31              $V1099.7  1100.0   1100.1  1100.15   1100.2   1100.5
   32              K      99
```

SHEET 9 OF 13

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
MBJ UPDATE 04 JUN 79
****

RUN DATE 03/25/80
TIME 14.52

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSES OF POLK DAM
UNIT HYDROGRAPH BY SCS METHOD

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	30	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0	0		

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

RUNOFF HYDROGRAPH TO DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	1.43	0.0	1.43	0.0	0.0	0	1	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	-1.00	-73.00	0.0	0.0

CURVE NO = -73.00 WETNESS = -1.00 EFFECT CN = 73.00

UNIT HYDROGRAPH DATA
TC= 0.0 LAG= 0.59

RECESSION DATA
STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
0													
									SUM	4.90	2.20	2.70	4660.
										(124.4	56.1	69.1	132.1)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING FOR POLK DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-1093.	-1

STAGE	1093.00	1093.15	1093.75	1094.50	1096.00	1097.50	1098.00	1099.00
FLOW	0.0	1.88	21.05	59.54	168.42	309.65	315.00	315.00
SURFACE AREA=	7.	8.	12.	116.				
CAPACITY=	0.	52.	119.	1212.				
ELEVATION=	1086.	1093.	1100.	1120.				

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1093.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1099.7	3.1	1.5	292.

CREST LENGTH AT OR BELOW ELEVATION	0.	105.	175.	235.	290.	312.
	1099.7	1100.0	1100.1	1100.1	1100.2	1100.5

PEAK OUTFLOW IS 471. AT TIME 18.00 HOURS

NOTE: A DAMWID VALUE OF 292 FT WAS USED FOR THE OVERTOPPING ANALYSIS. THIS IS THE LENGTH OF DAM CREST SUBJECT TO ACTIVE OVERTOPPING.

********** ********** ********** ********** **********

SHEET 11 OF 13

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO APPLIED TO FLOWS 1.00
HYDROGRAPH AT	1	1.43 (3.70)	1	1043. (29.54)
ROUTED TO	2	1.43 (3.70)	1	471. (13.34)

SHEET 12 OF 13

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1093.00	1093.00	1099.70
STORAGE	52.	52.	115.
OUTFLOW	0.	0.	315.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1100.31	0.61	122.	411.	1.50	10.00	0.0

APPENDIX E

PLATES

CONTENTS

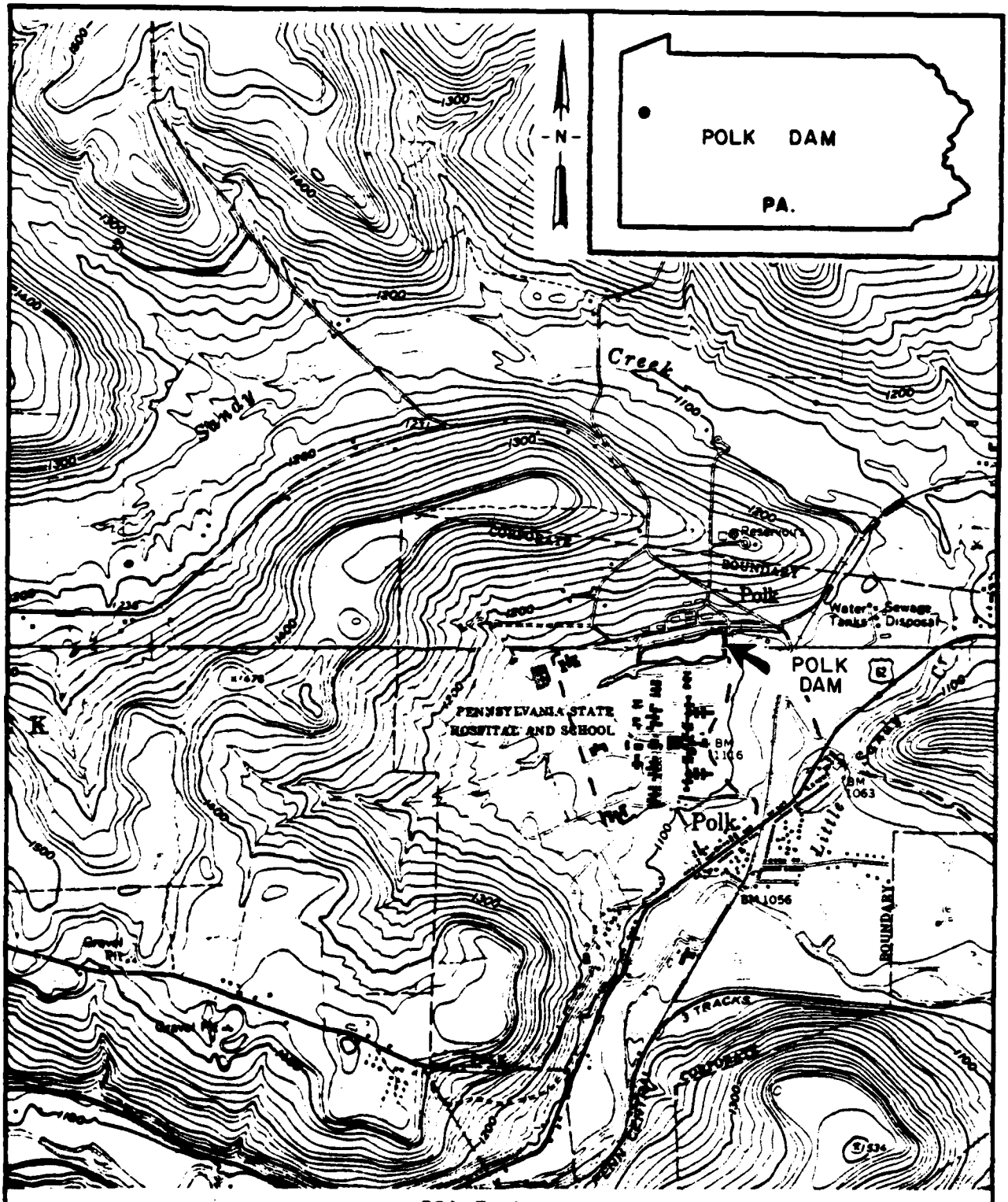


PLATE 1 LOCATION PLAN
POLK DAM

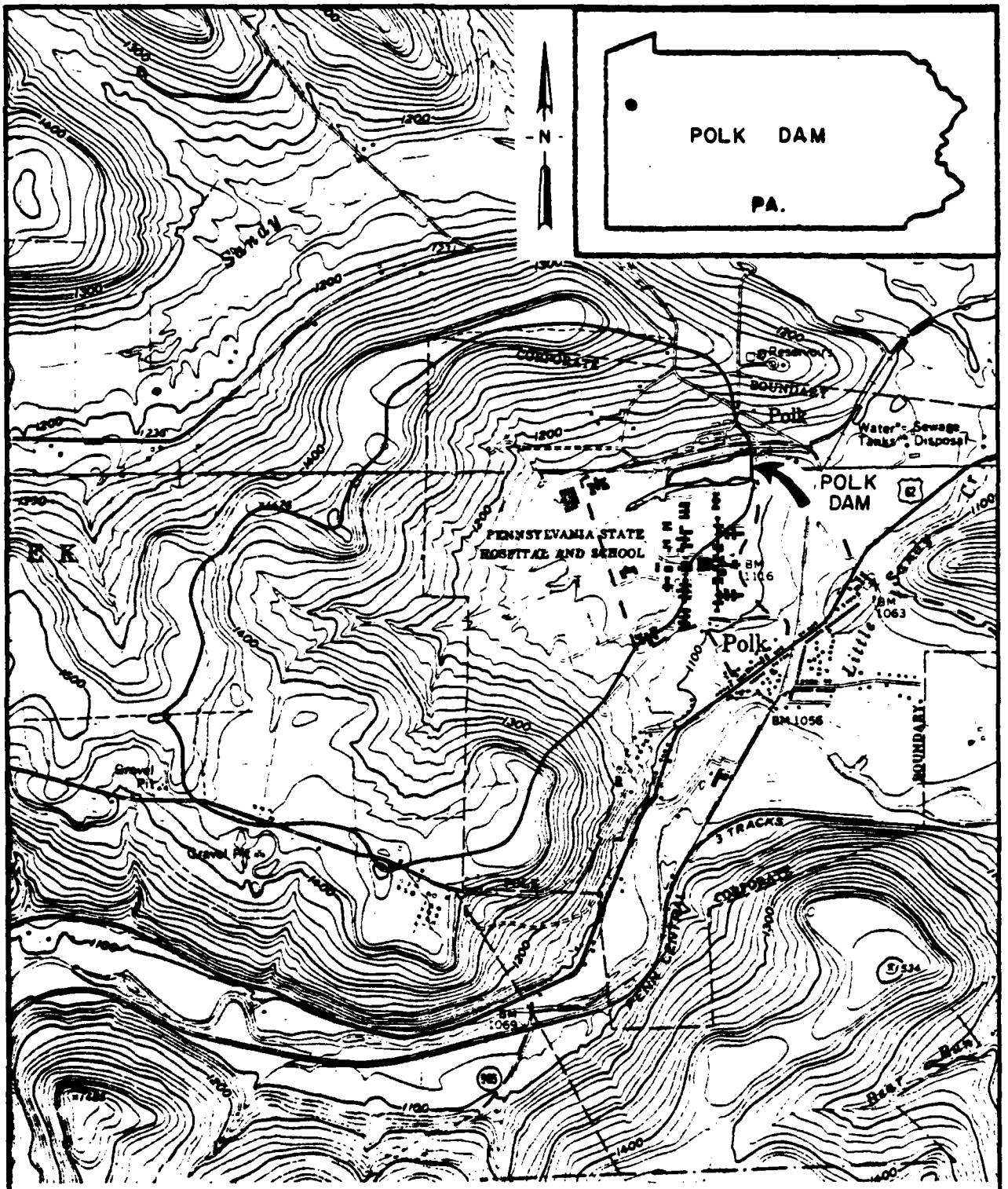
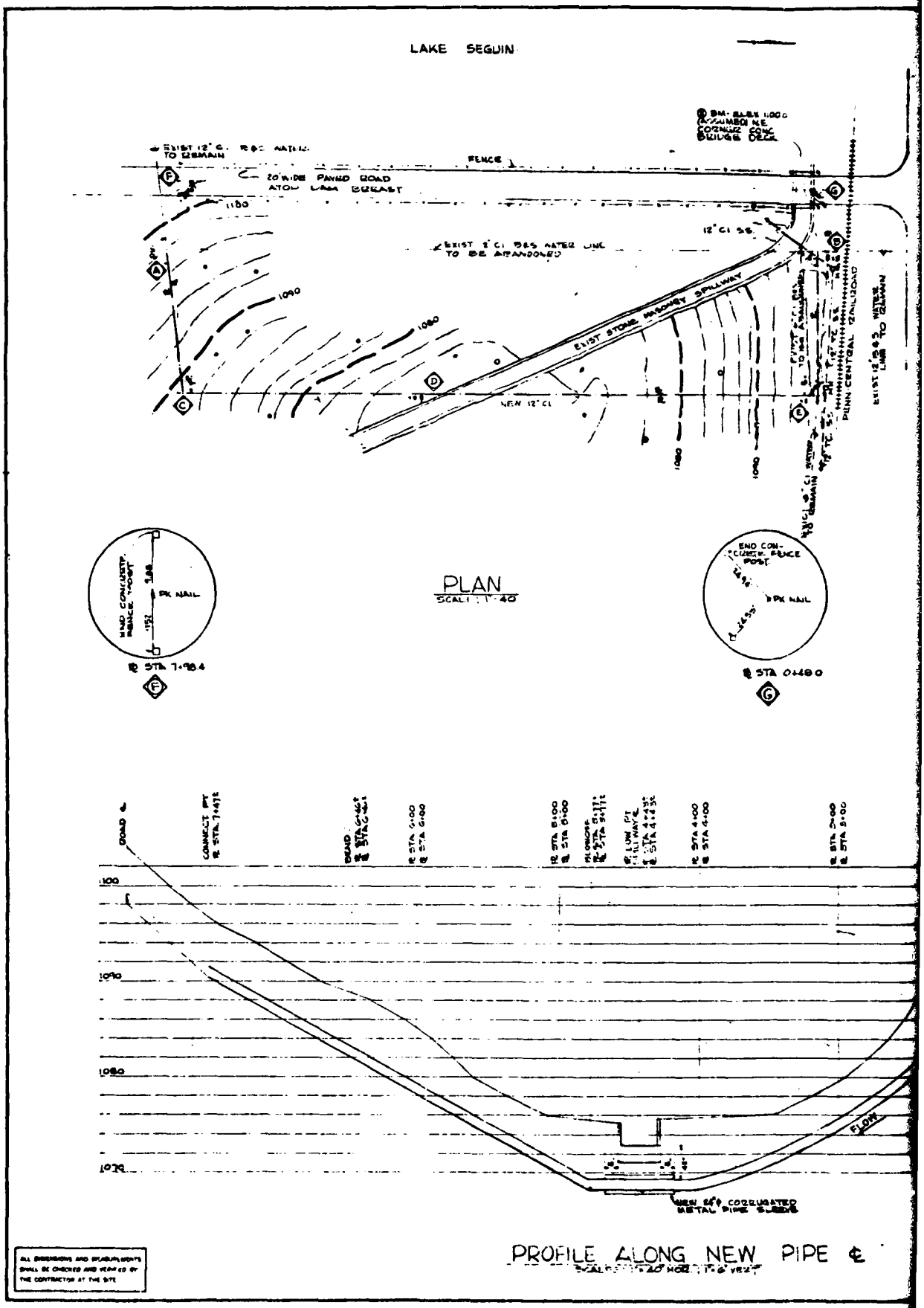
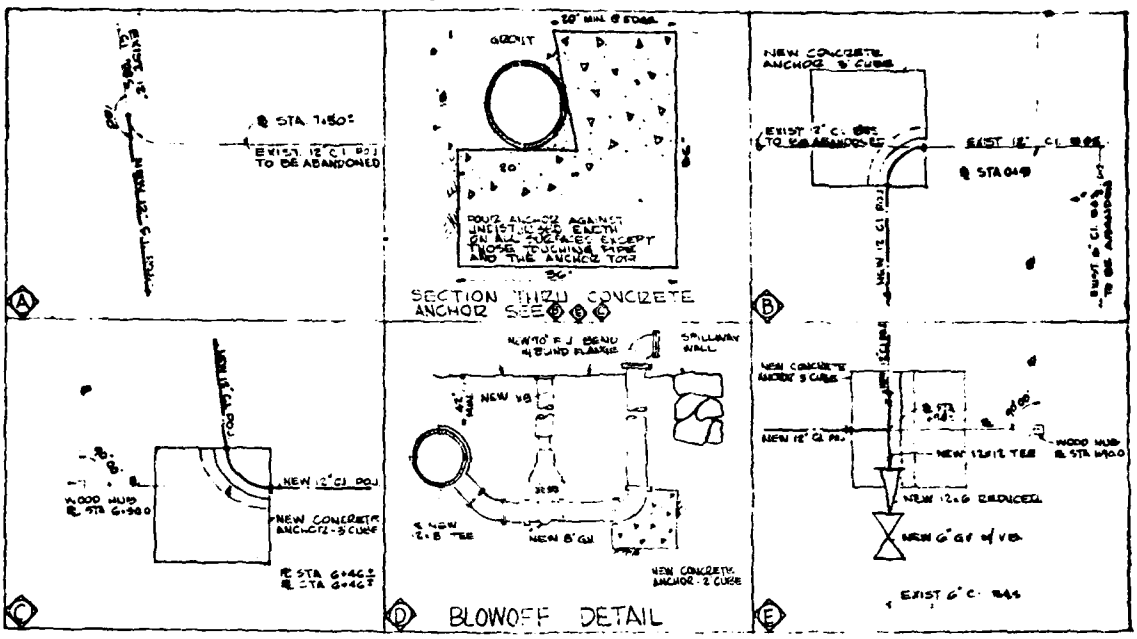


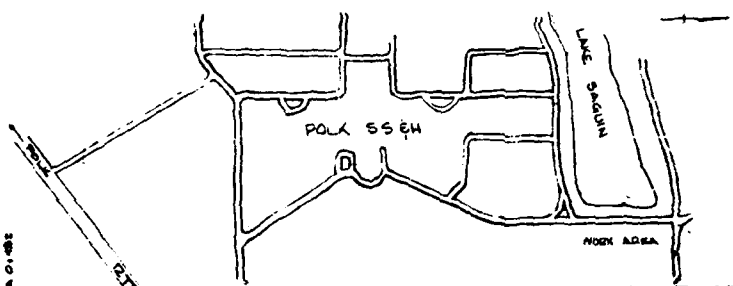
PLATE 2 WATERSHED MAP

POLK DAM

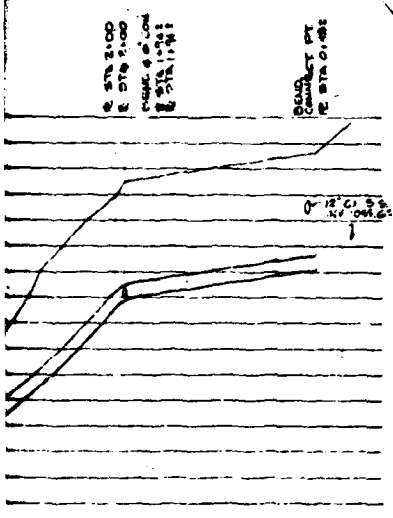

LAKE SEGUIN
EXIST 12" C.I. B&S WATER TO REMAIN
FENCE
20' WIDE PAVED ROAD ATOW LAKE EGBERT
EXIST 2" C.I. B&S WATER LINE TO BE ABANDONED
EXIST STONE MASONRY SPILLWAY
NEW 12" C.I.
12" C.I. S.S.
EXIST 12" S.S. WATER LINE TO REMAIN
PENN CENTRAL RAILROAD
1100
1090
1080
END CONCRETE FENCE POST
PK NAIL
℄ STA 7+98.4
℄ STA 0+48.0
PLAN
SCALE: 1"=40'
ROAD ℄
CONNECT PIT ℄ STA 7+47.2
℄ STA 6+00
℄ STA 5+00
℄ STA 4+00
℄ STA 3+00
FLOW
NEW 24" CORRUGATED METAL PIPE CULVERT
ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED BY THE CONTRACTOR AT THE SITE
PROFILE ALONG NEW PIPE ℄



DETAILS & PIPE ASSEMBLIES
NO SCALE



LOCATION PLAN
NO SCALE



NOTES & LEGEND

G V	GATE VALVE
PT	POINT
S &	BASE LINE
&	PIPE LINE
SCI	CAST IRON PIPE
STC	TERRA COTTA PIPE
P.J.	BELL & SPIGOT PIPE
P.O.J.	PUSH-ON JOINT PIPE
S.S.	SANITARY SEWER
V.B.	VALVE BOX
	UTILITY POLE
	TREE

MINIMUM DEPTH OF BURY FOR WATER LINES - 42"
MAXIMUM DEPTH OF BURY FOR WATER LINES - 8'

REVISIONS					
SYMBOL	CORRECTIONS				

APPROVALS

APPROVED
DIRECTOR - BUREAU OF ENGINEERING & CONSTRUCTION
APPROVED
SUPERVISING ENGINEER - BUREAU OF ENGINEERING & CONSTRUCTION
APPROVED
FOR DEPT. OF PUBLIC WORKS, SECRETARY
SUBMITTED BY WILLIAM J. HOSKINS, P.E.

CHECKED BY			
ARCH.	CIVIL & STRUCT.	MECH.	ELECT.

PROJECT NO. PW 7751-3

PLANS & DETAILS

RELOCATE WATER LINE POLK STATE SCHOOL & HOSPITAL POLK, (VENANGO) COUNTY, PENNA.

BUREAU OF ENGINEERING & CONSTRUCTION
DEPARTMENT OF PROPERTY & SUPPLIES

DATE	COMMONWEALTH OF PENNSYLVANIA
JAN '70	RAYMOND P. SHAFER, GOVERNOR
SCALE	DEPT. OF PROPERTY & SUPPLIES
AS NOTED	WILLIAM C. HAMM, JR., SECRETARY
	HARRISBURG, PENNSYLVANIA

PLATE 3

APPENDIX F

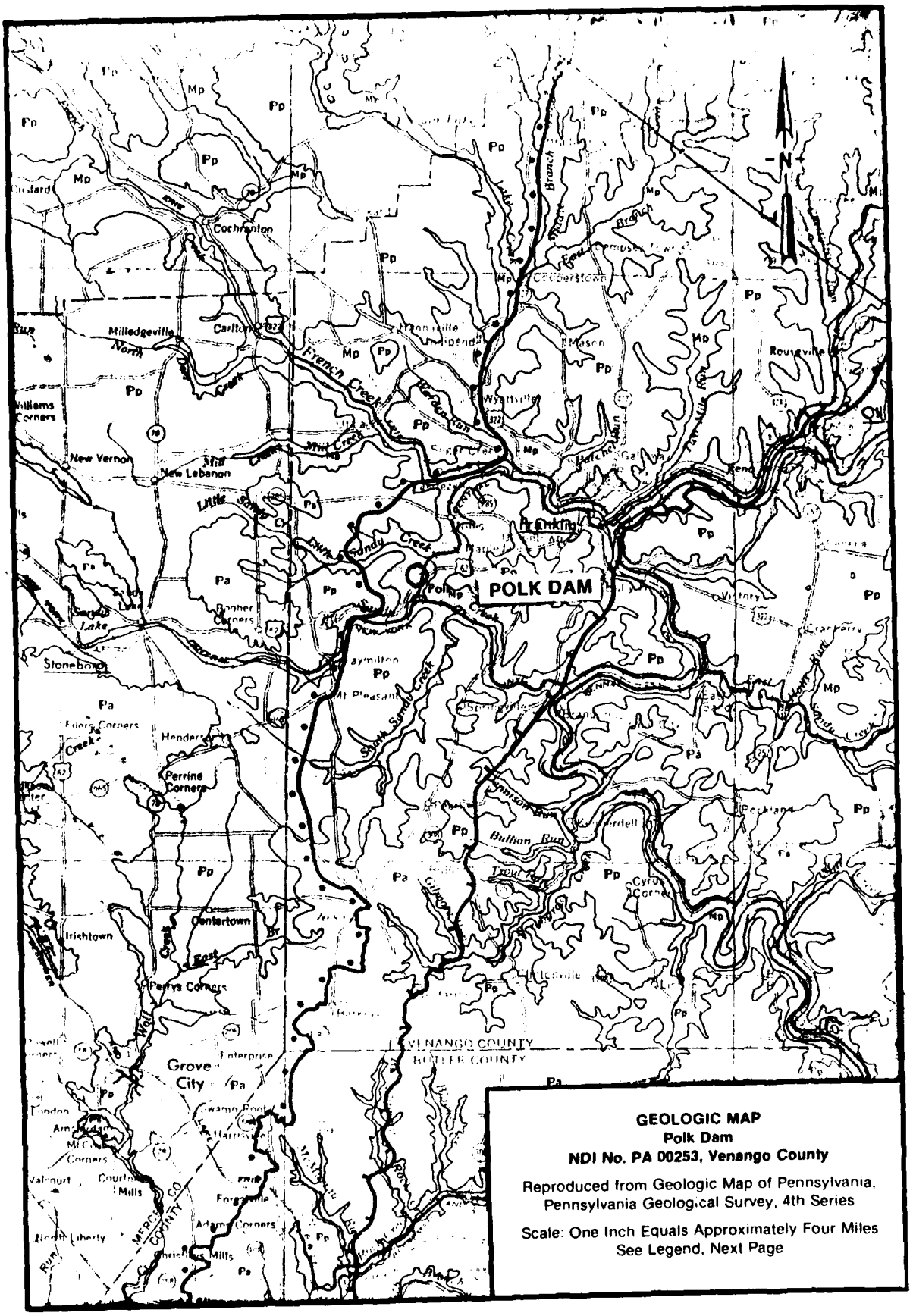
REGIONAL GEOLOGY

POLK DAM
NDI No. PA 00253, PennDER No. 61-7

REGIONAL GEOLOGY

Polk Dam is located in the glaciated section of the Appalachian Plateaus Physiographic Province. Bedrock units below the glacial soils are members of the Pocono group, Pennsylvanian system. Regionally, these gently dipping strata are sandstone and conglomerates which are generally hard, gray, and massive with shale seams. However, no site exploration data, i.e., test pits or borings, were available for review.

Geologic references indicate that the dam is located on outwash deposits. An old well log record in the general vicinity of the dam indicates approximately 30 feet of sand and gravel overlying bedrock. The end of the Wisconsin advance is shown 1.5 miles to the west of the dam and the hills to the north and west of the dam are indicated as the inner phase ground moraine of the Illinoian stage.



GEOLOGIC MAP
Polk Dam
NDI No. PA 00253, Venango County

Reproduced from Geologic Map of Pennsylvania, Pennsylvania Geological Survey, 4th Series

Scale: One Inch Equals Approximately Four Miles
See Legend, Next Page

LEGEND

PERMIAN

Greene Formation

Cyclic sequences of sandstone, shale, red beds, limestone and coal, base at the top of the Upper Washington Limestone

PERMIAN AND PENNSYLVANIAN

Washington Formation

Cyclic sequences of sandstone, shale, limestone and coal; some red shale, some minable coal; base at the top of the Waynesburg Coal.

PENNSYLVANIAN

APPALACHIAN PLATEAU

Pm

Monongahela Formation

Cyclic sequences of sandstone, shale, limestone and coal; limestone prominent in northern outcrop areas, shale and sandstone increase southward; commercial coals present; base at the bottom of the Pittsburgh Coal.

Pc

Conemaugh Formation

Cyclic sequences of red and gray shales and siltstones with thin limestones and coals; massive Mahoning Sandstone commonly present at base; Ames Limestone present in middle of sections; Brush Creek Limestone in lower part of section.

Pa

Allegheny Group

Cyclic sequences of sandstone, shale, limestone and coal, numerous commercial coals, limestones thicken westward. Vanport Limestone in lower part of [illegible] Freeport, Kittanning, and Clarion Formations.

Pp

Pottsville Group

Predominantly sandstones and conglomerates with thin shales and coals, some coals mineable locally.

ANTHRACITE REGION

Ppp

Post-Pottsville Formations

Brown or gray sandstones and shales with some conglomerate and numerous minable coals.

Pp

Pottsville Group

Light gray to white, coarse grained sandstones and conglomerates with some minable coal; includes Sharp Mountain, Schuylkill, and Tumbling Run Formations.

MISSISSIPPIAN

Mmc

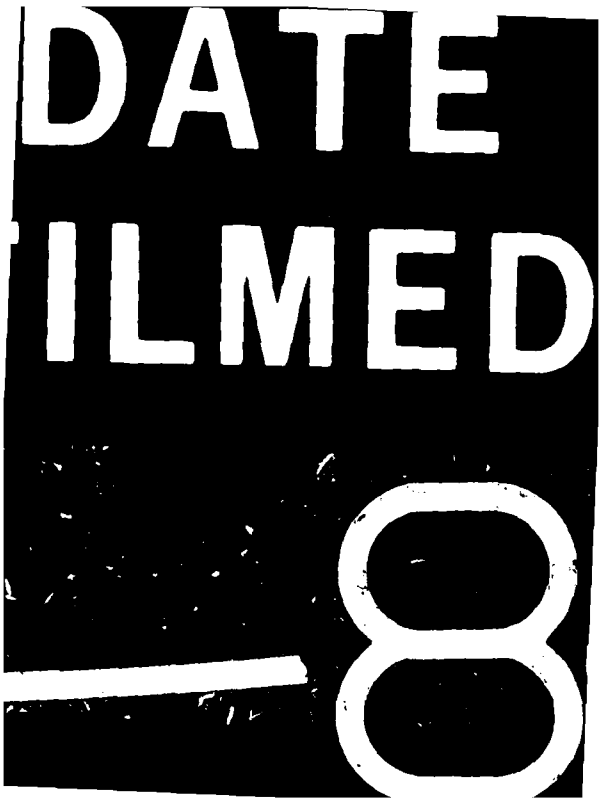
Mauch Chunk Formation

Red shales with brown to green and gray [illegible] sandstone; includes [illegible] Limestone in Fayette, Westmoreland, and Somerset counties, Loyalhanna Limestone at the base in southwestern Pennsylvania

Mp

Pocono Group

Predominantly gray, hard, massive, coarse bedded conglomerate and sandstone with some shale, includes in the Appalachian Plateau Burgoon, Shenango, Cuyahoga, Corry, and Knapp Formations; includes part of "Oswayo" of M.L. Fuller in Potter and Tioga counties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